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Huang

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(54) **RETRACTABLE USB MEMORY STICK**

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(51) **Int. Cl.**
G06F 1/16 (2006.01)
H05K 5/00 (2006.01)
H05K 7/00 (2006.01)

(52) **U.S. Cl.** **361/679.31**

(58) **Field of Classification Search** . 361/679.31–679.45
See application file for complete search history.

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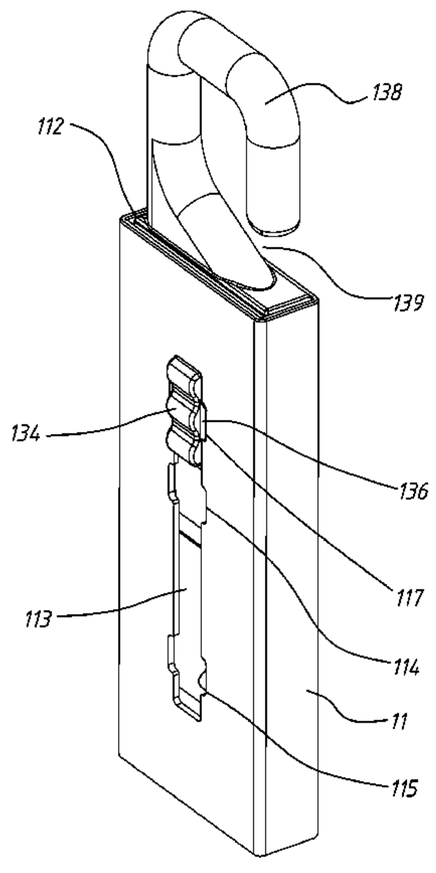
(57) **ABSTRACT**

A retractable USB memory stick includes a metal casing formed of a seamless flat tube having opposing front opening and rear opening, a sliding slot located on one peripheral wall thereof, and first and second locating holes located on the sliding slot, a PC board having a front USB interface circuit and a rear memory IC package, and an insulation PC board holder holding the PC board and slidably mounted in the metal casing. The insulation PC board holder has a spring strip bridged on the outside wall thereof, a sliding block located on the spring strip and forced by the spring power of the spring strip into the sliding slot of the metal casing, and a retaining block protruded from the sliding block for selectively engaging the first locating hole or second locating hole of the metal casing to lock the insulation PC board holder to the metal casing in the extended position and received position.

4 Claims, 18 Drawing Sheets



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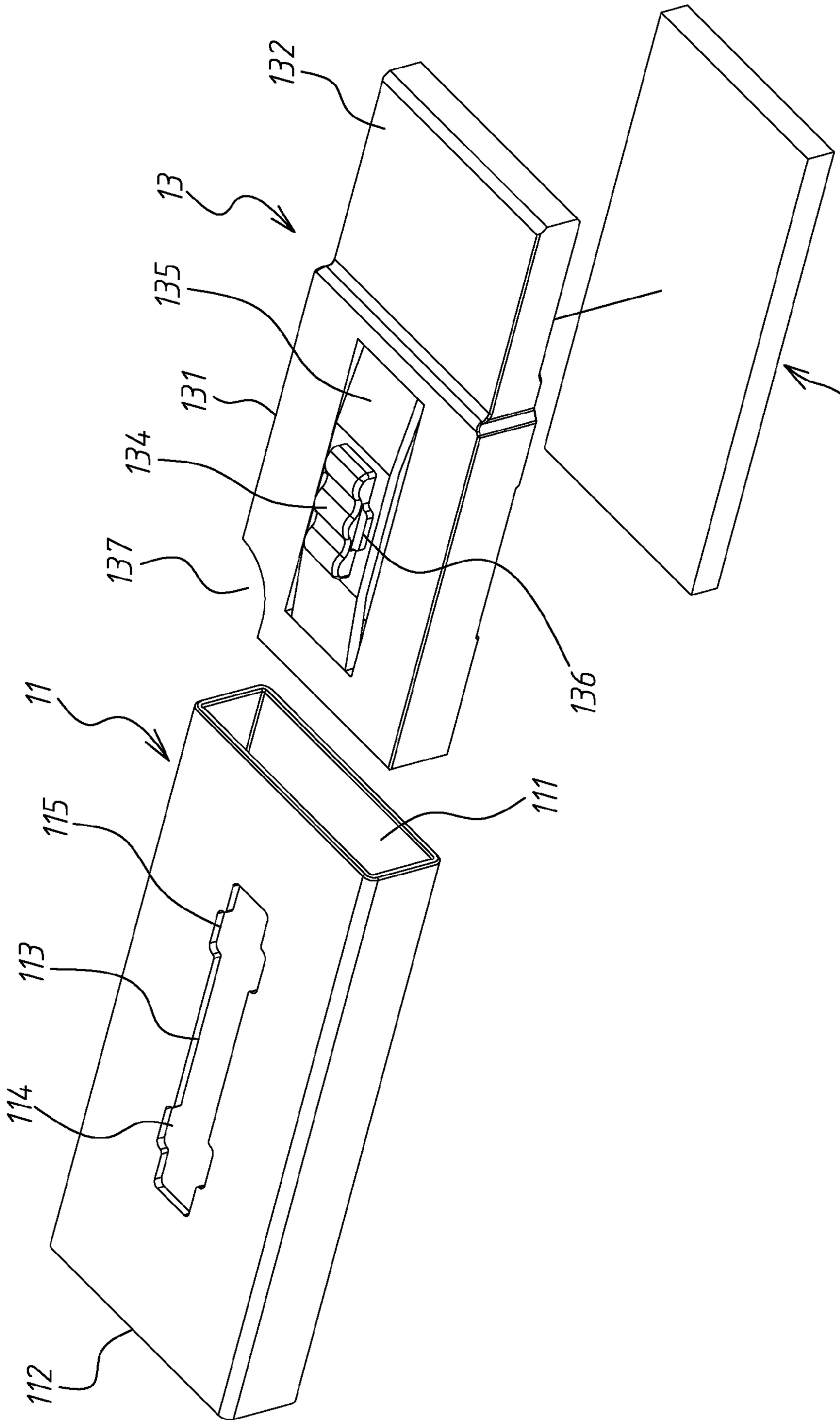


FIG. 1

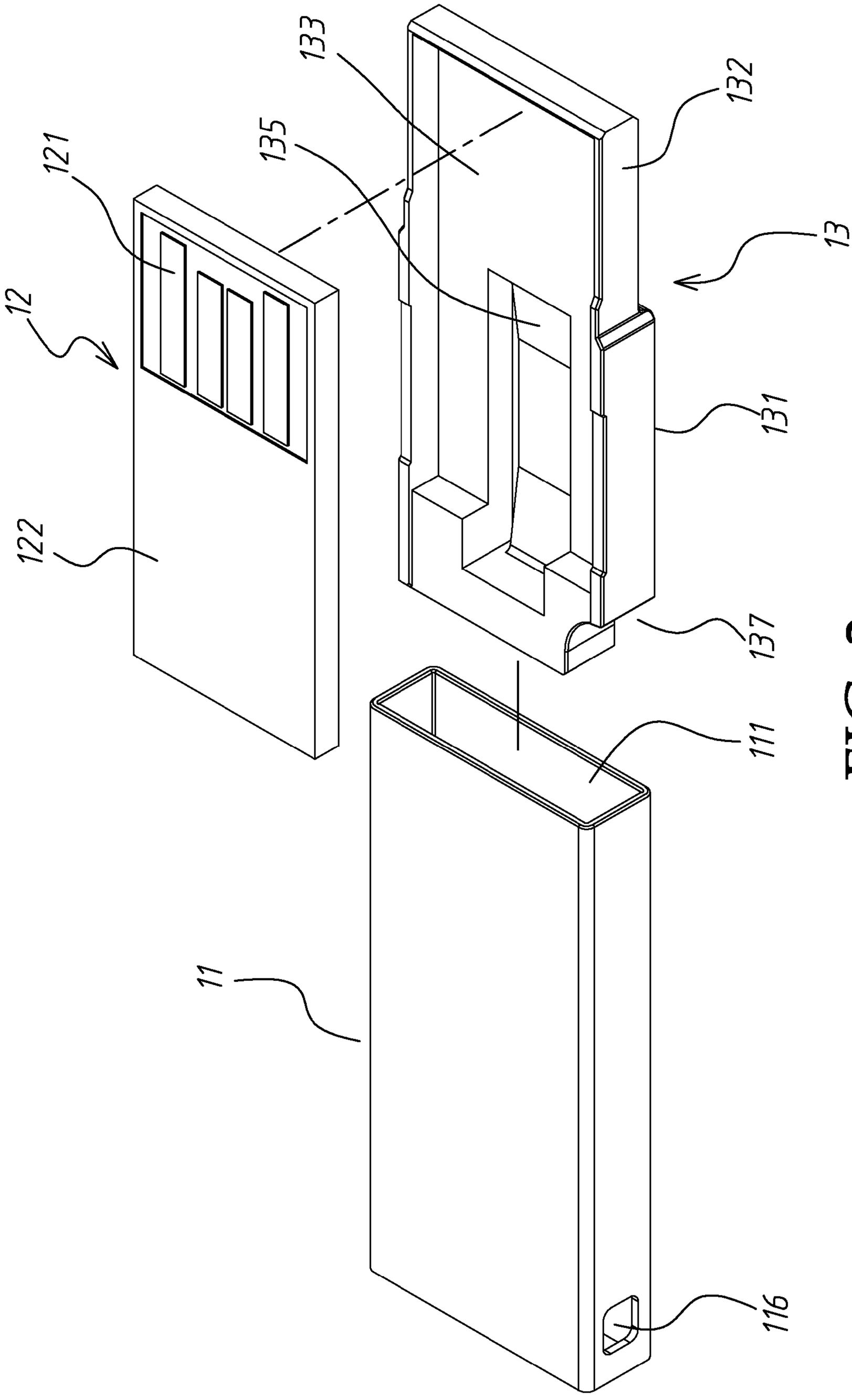


FIG. 2

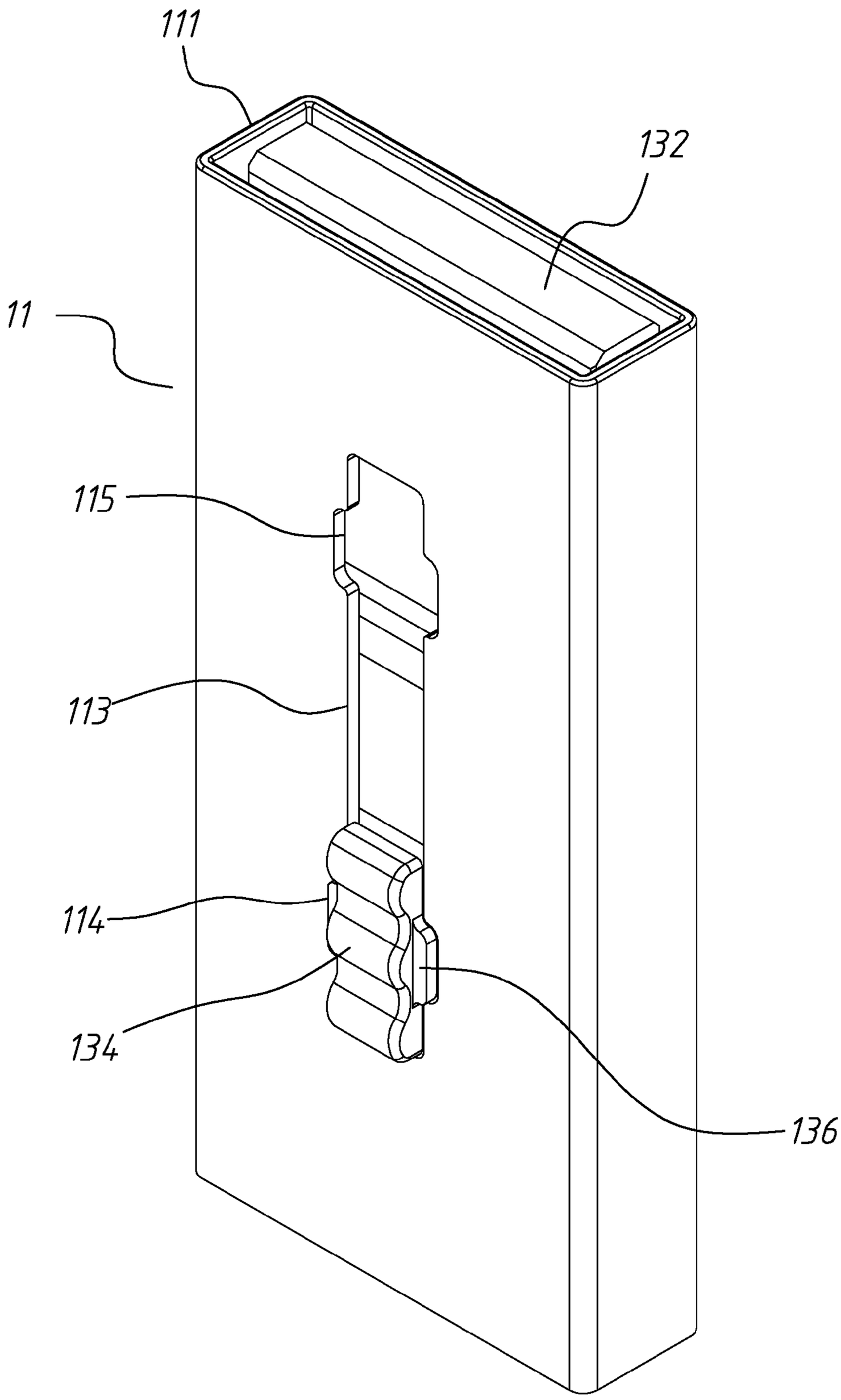


FIG. 3

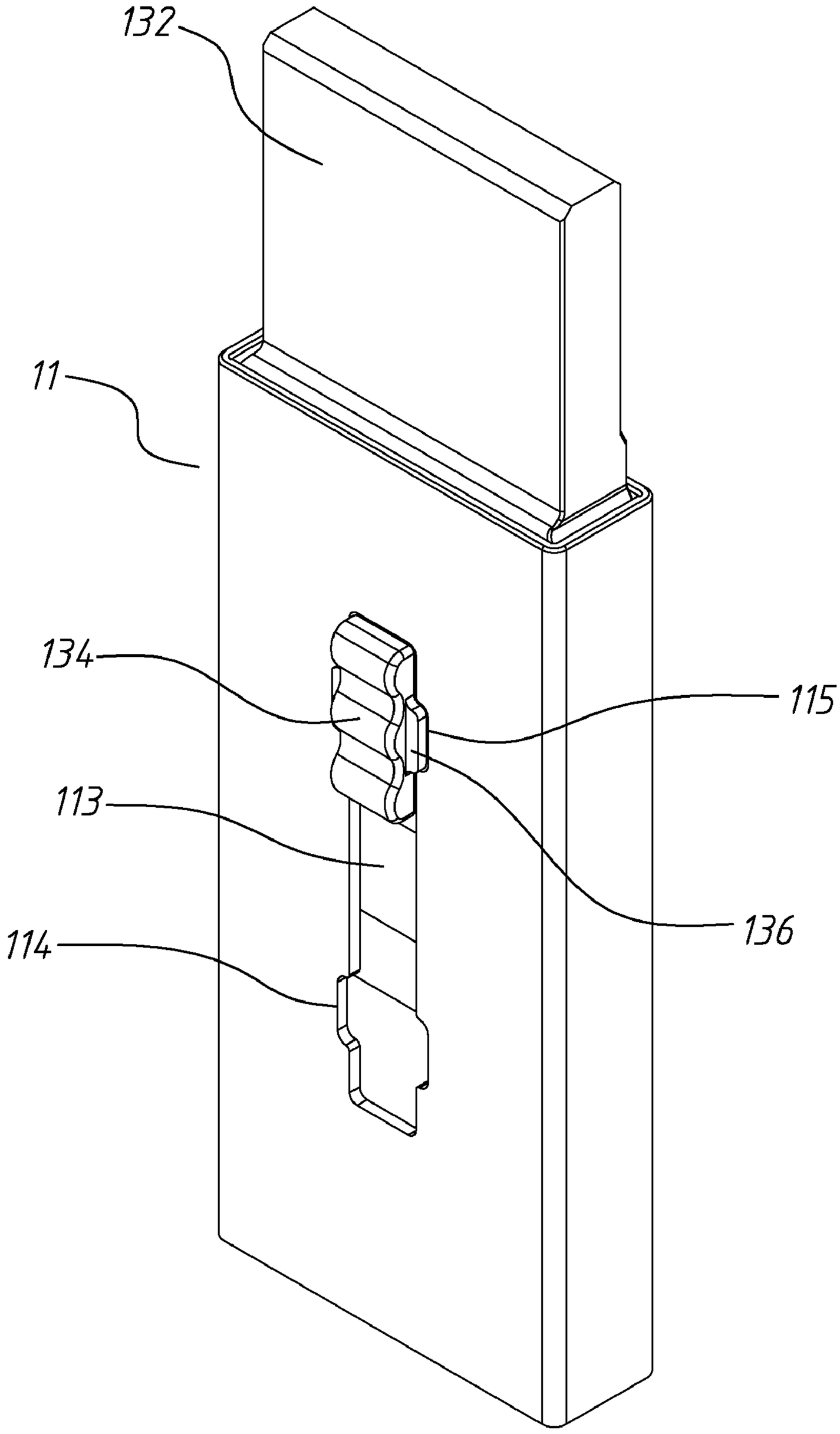
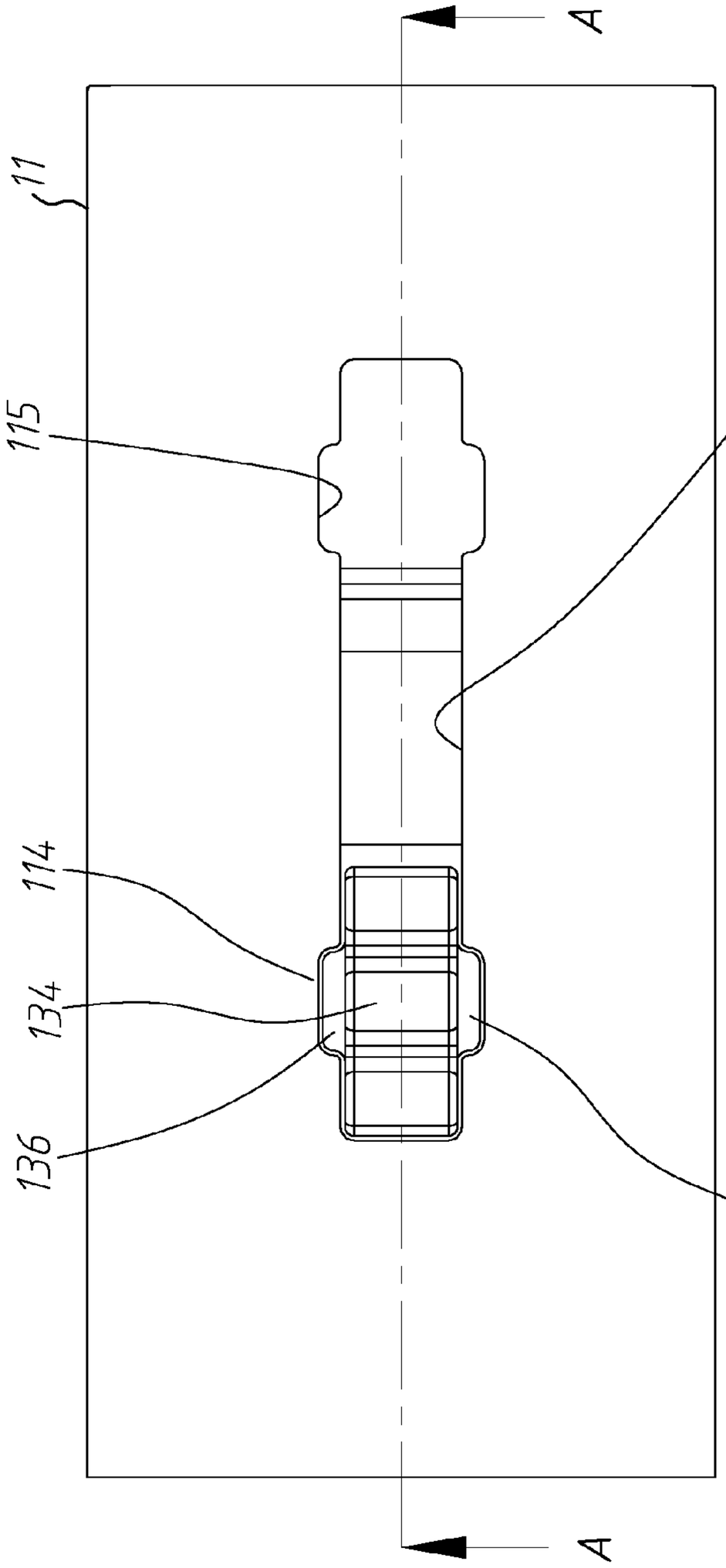


FIG. 4

FIG. 5



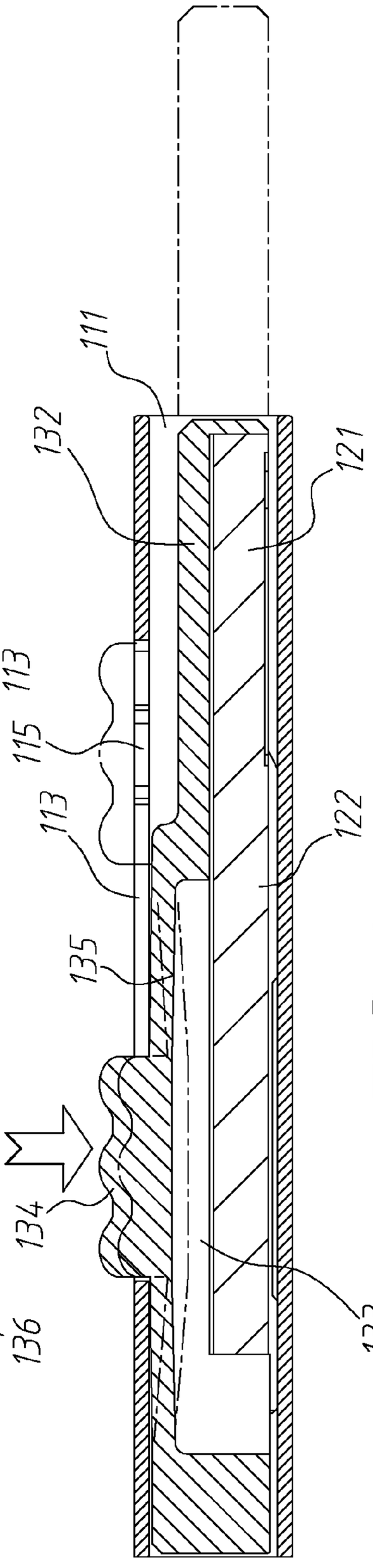


FIG. 6

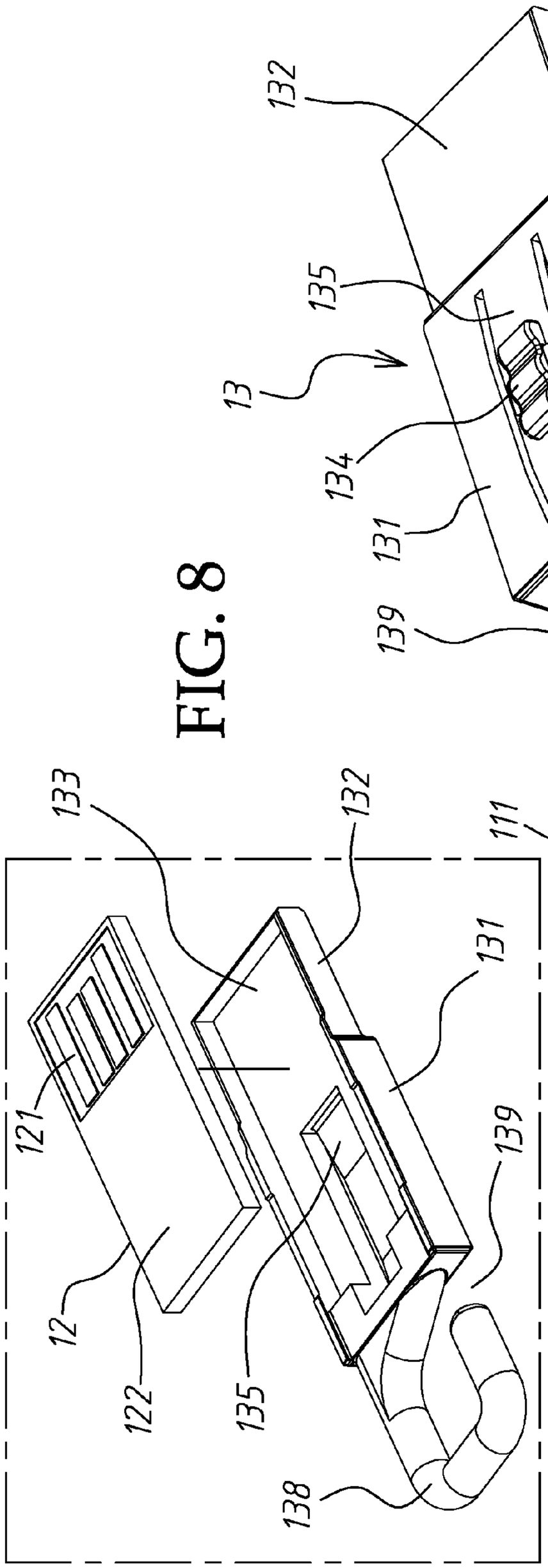

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FIG. 8

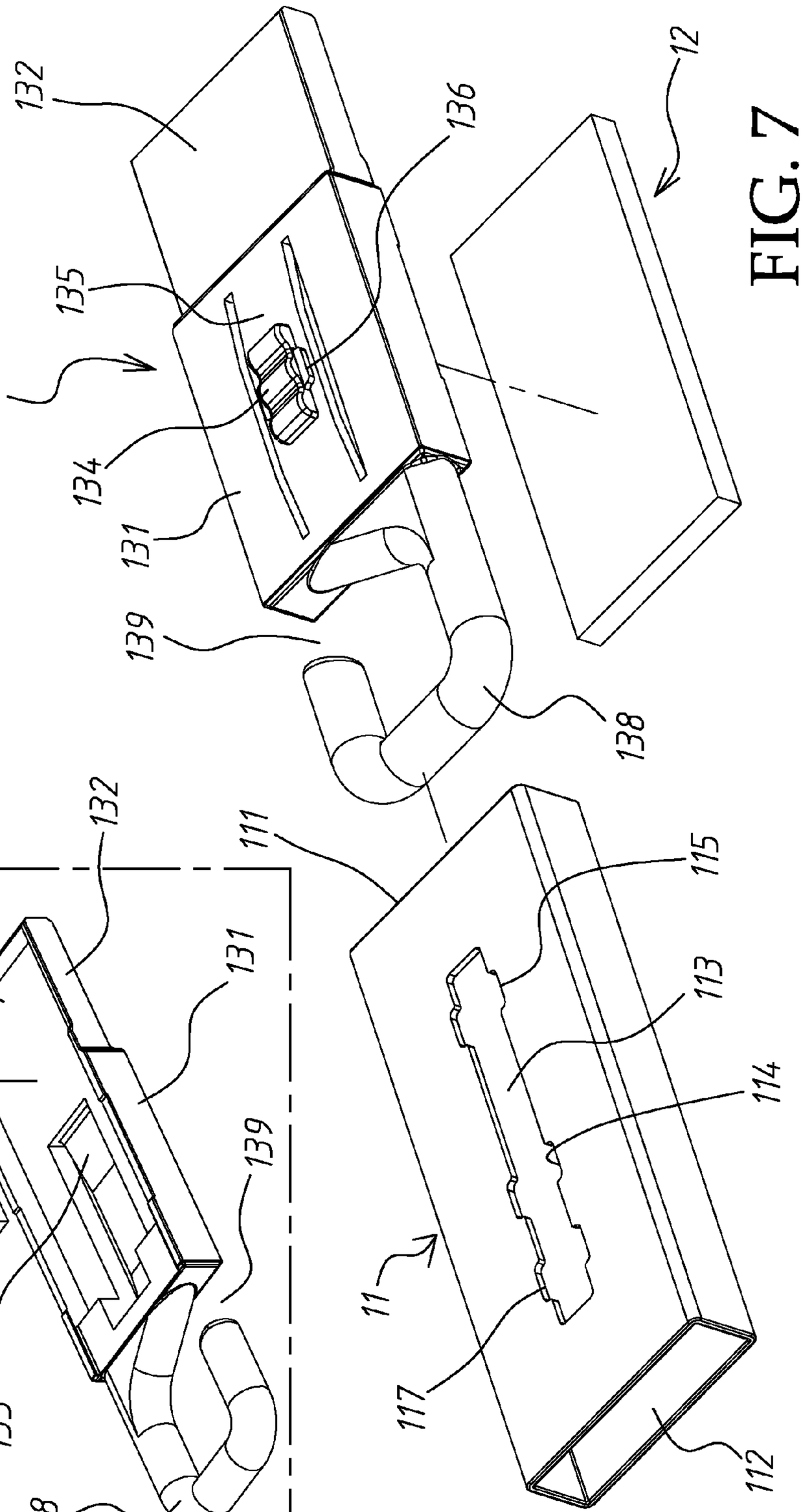
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FIG. 7

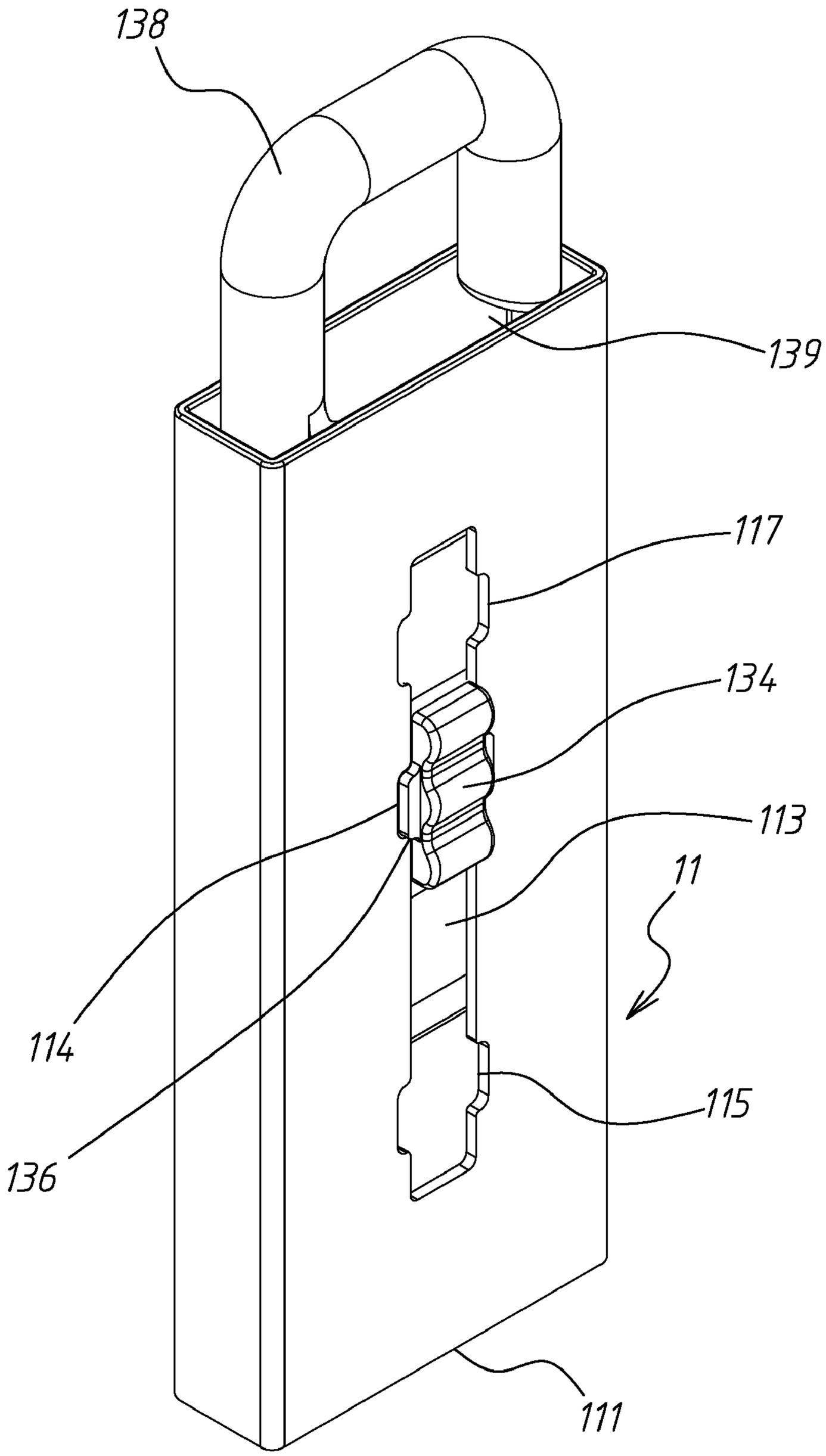

FIG. 9

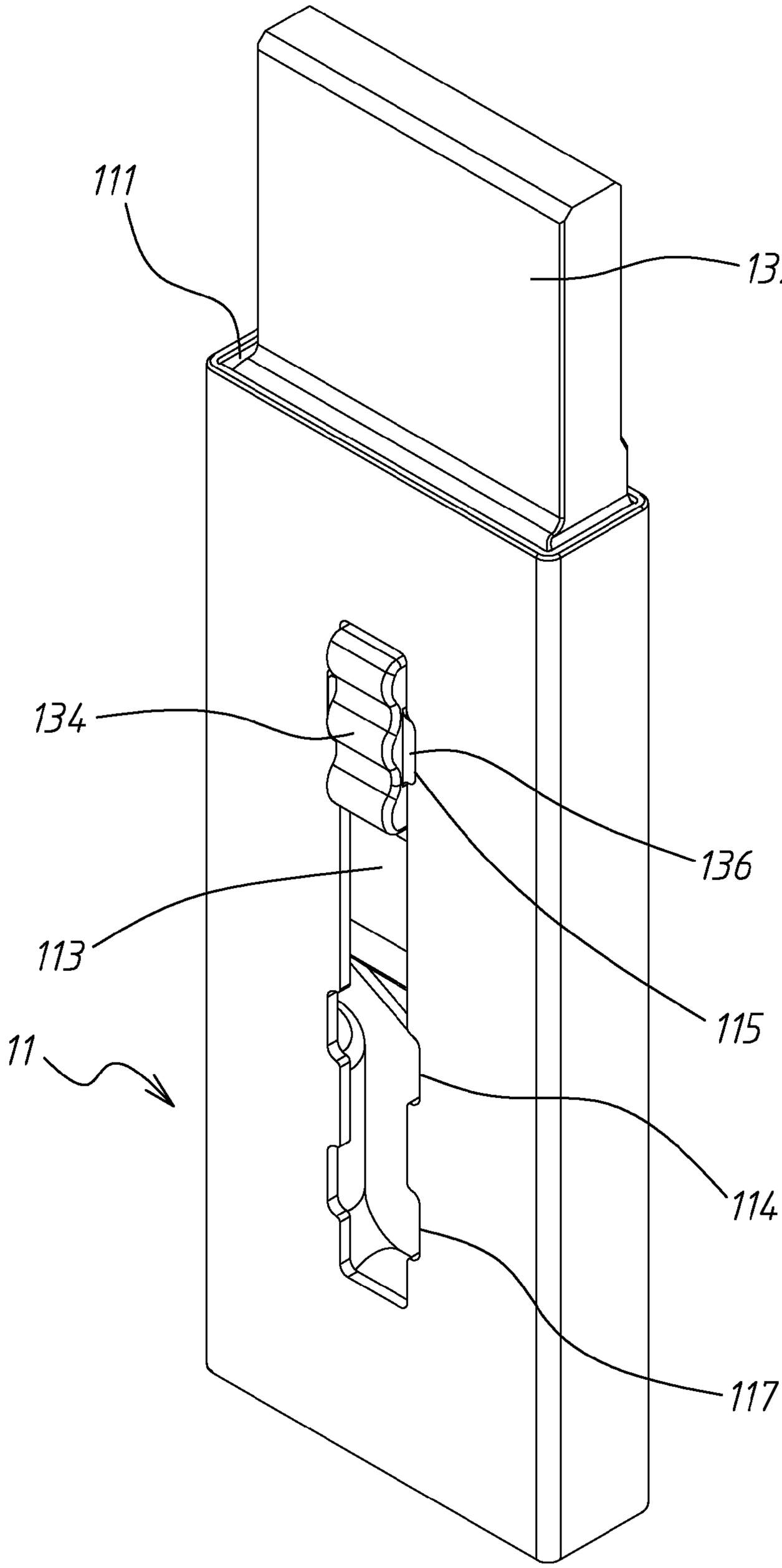

FIG. 10

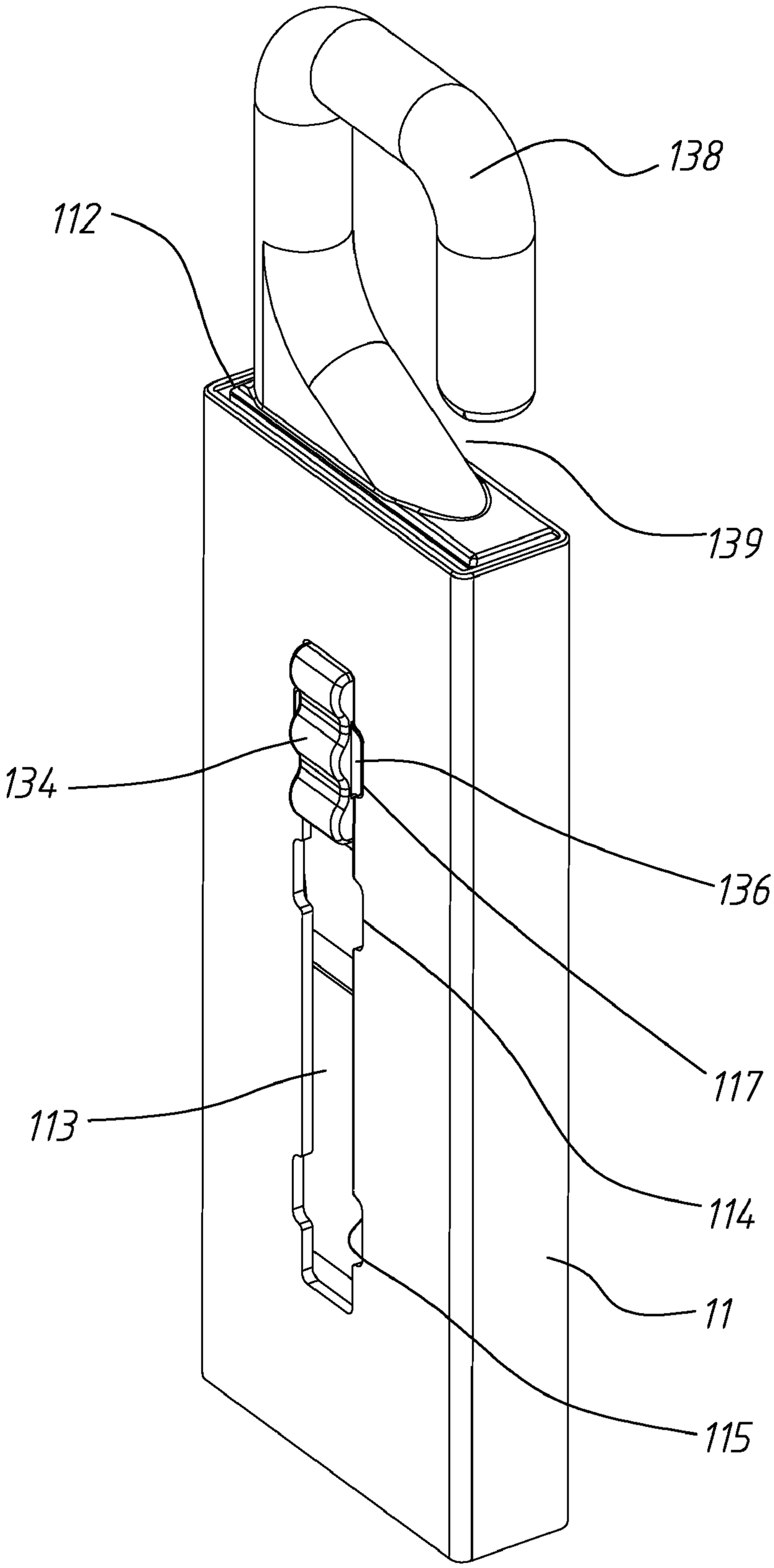

FIG. 11

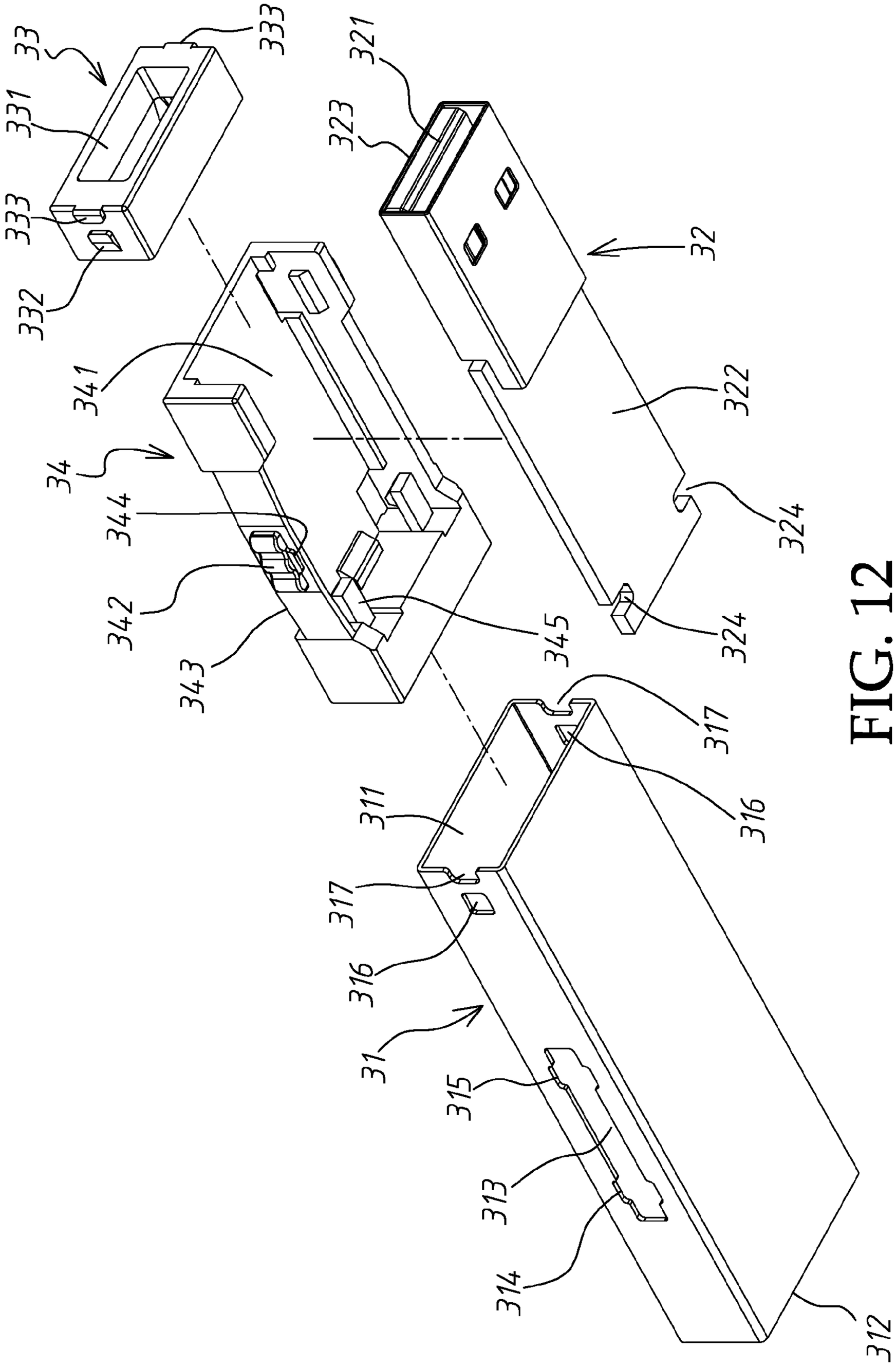
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FIG. 12

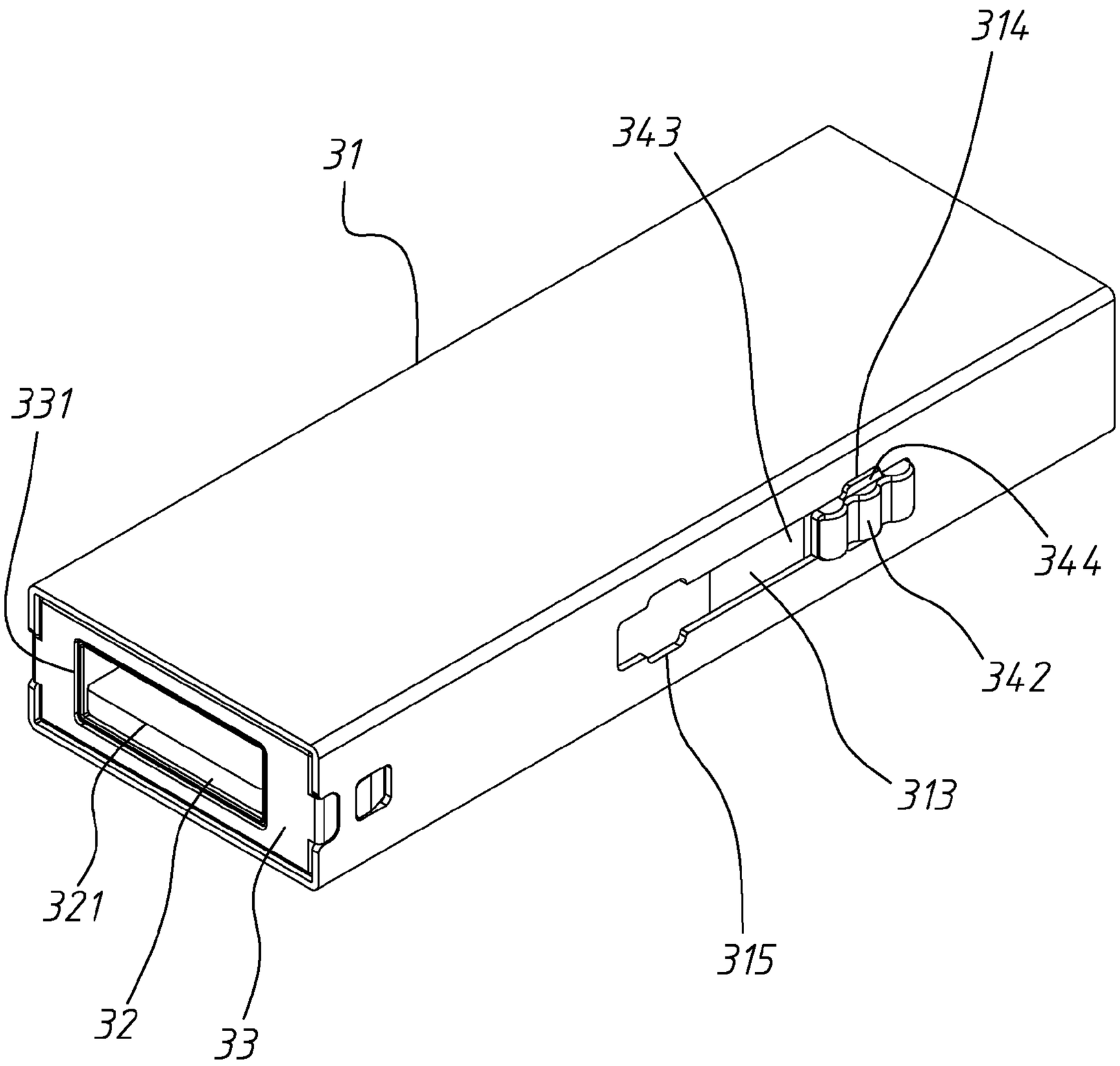

FIG. 13

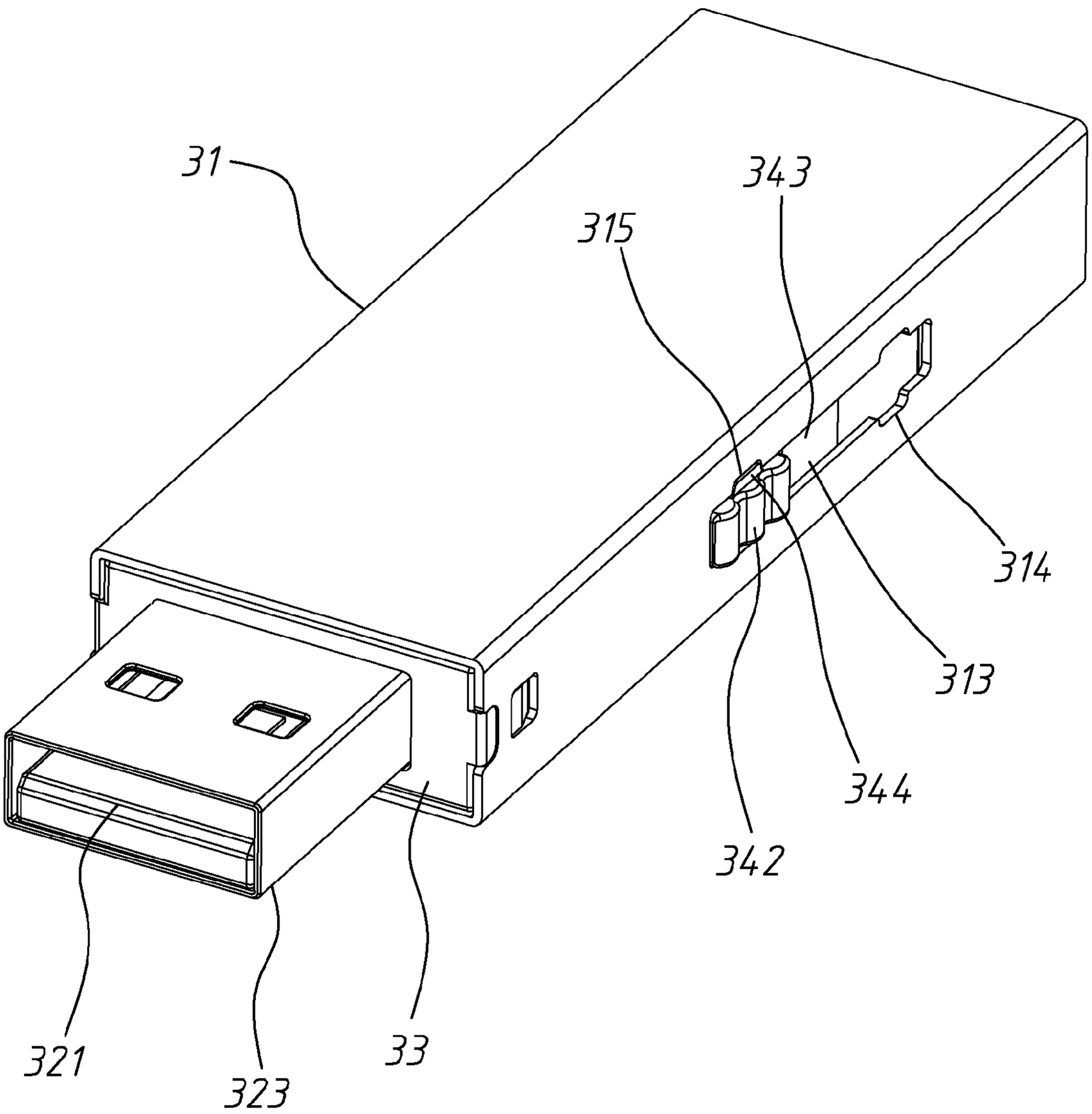

FIG. 14

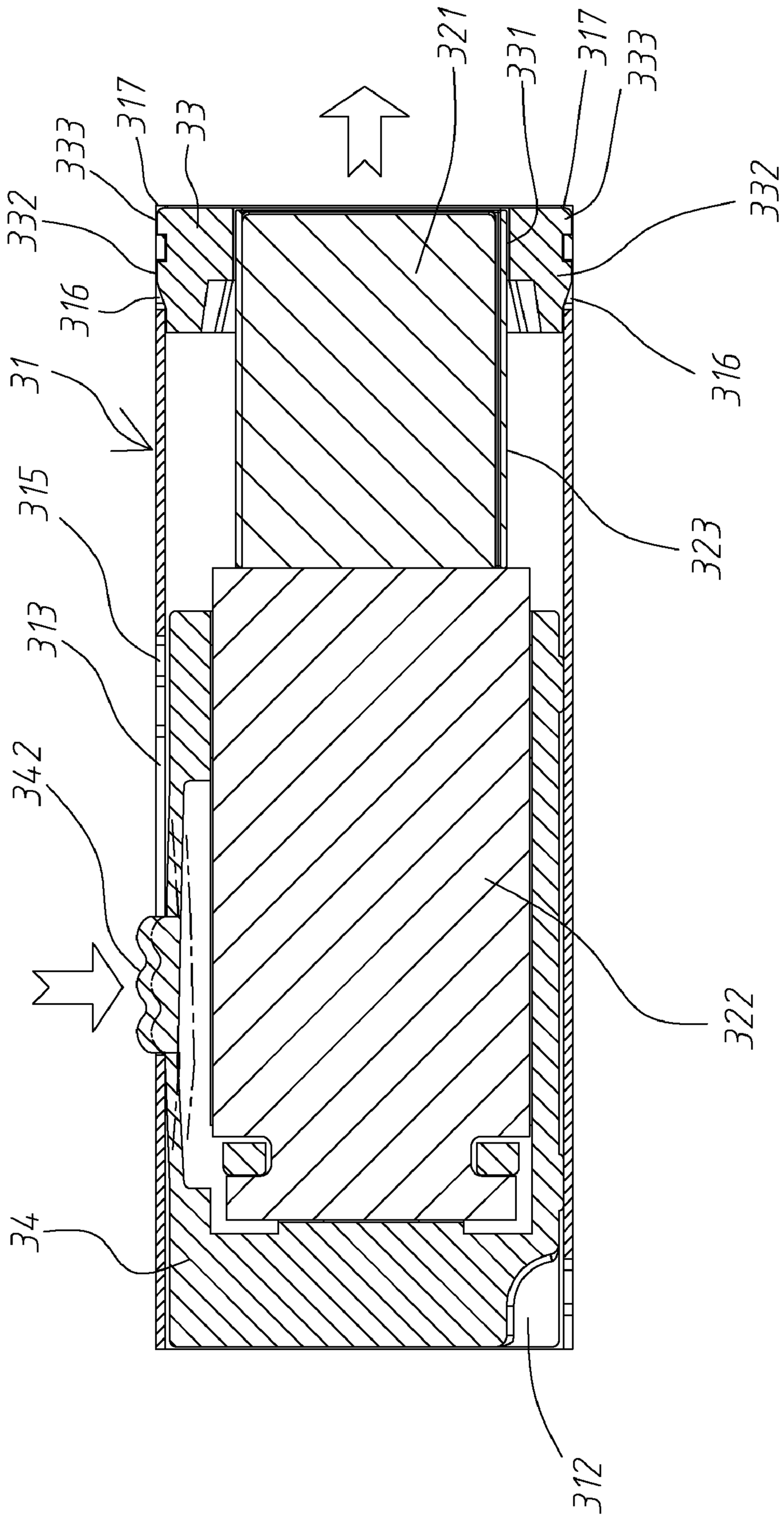
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FIG. 15

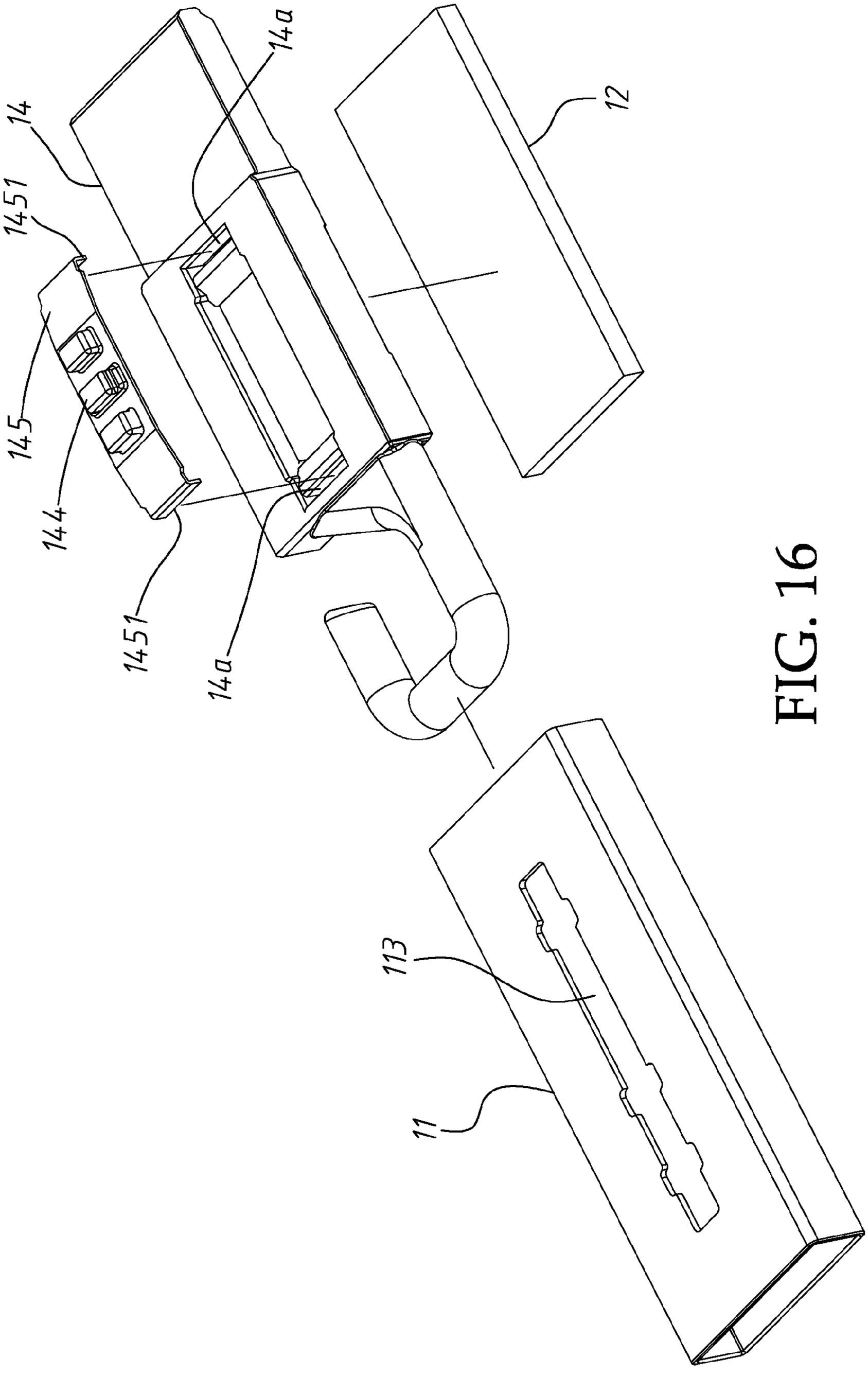

FIG. 16

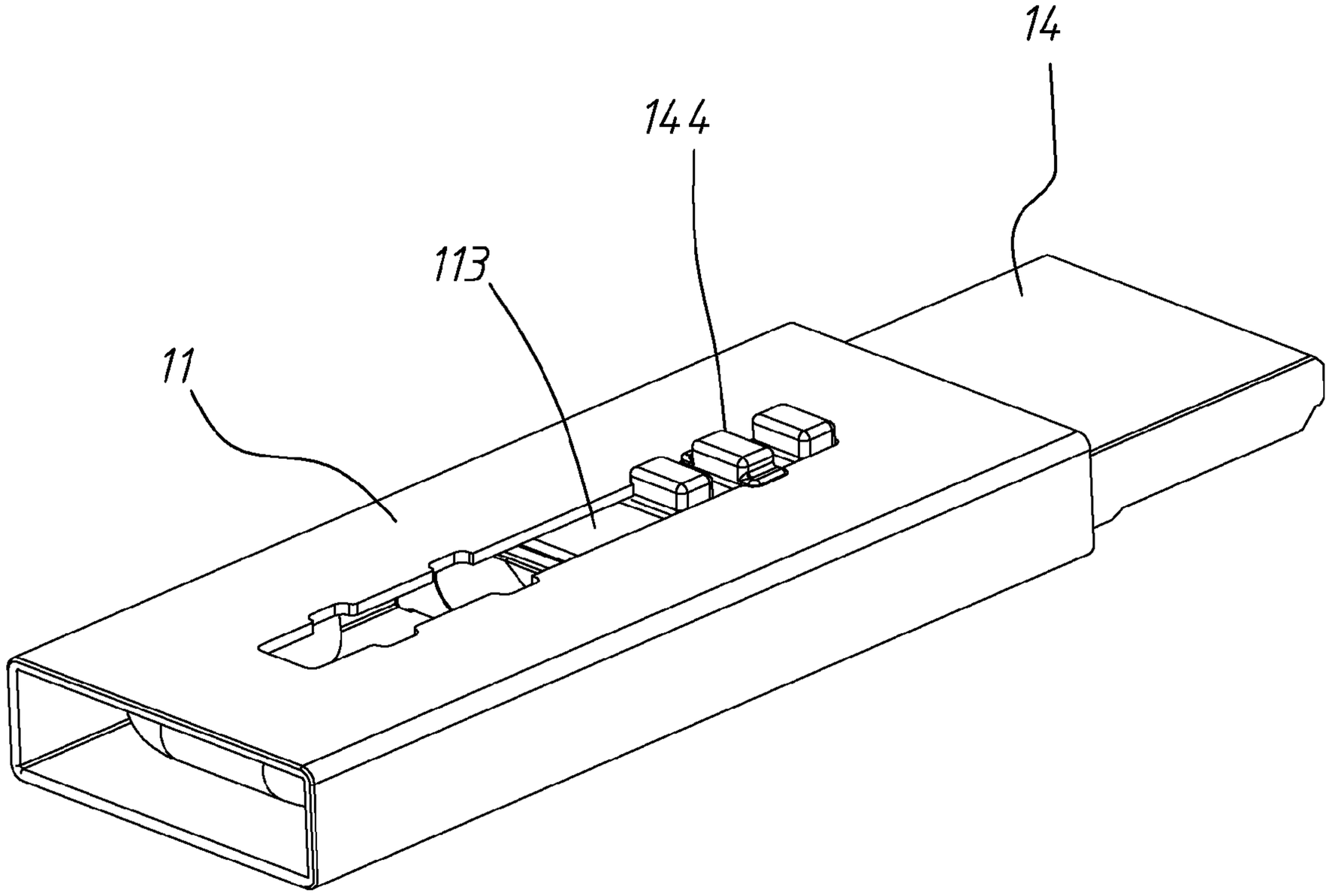

FIG. 17

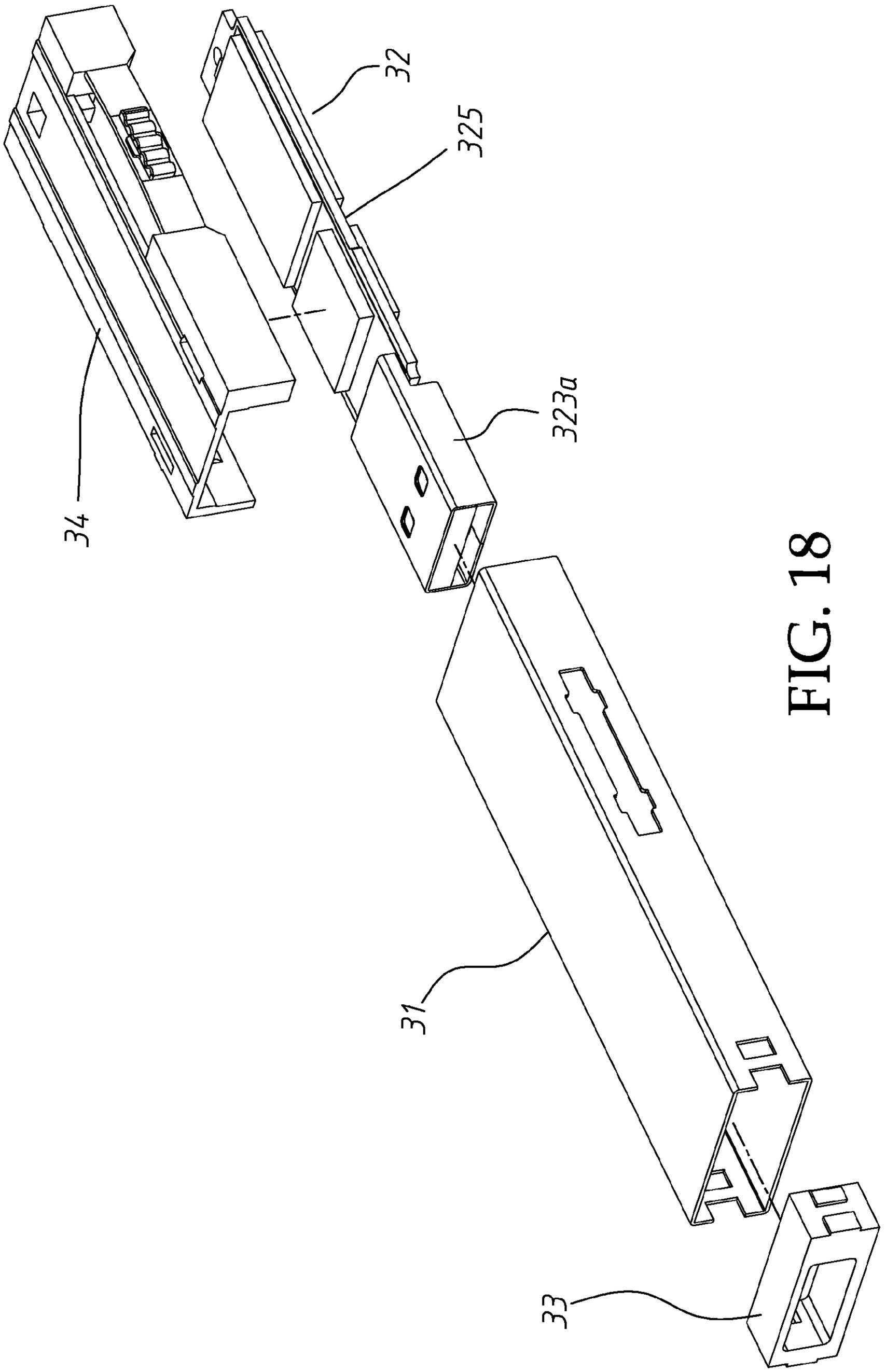

FIG. 18

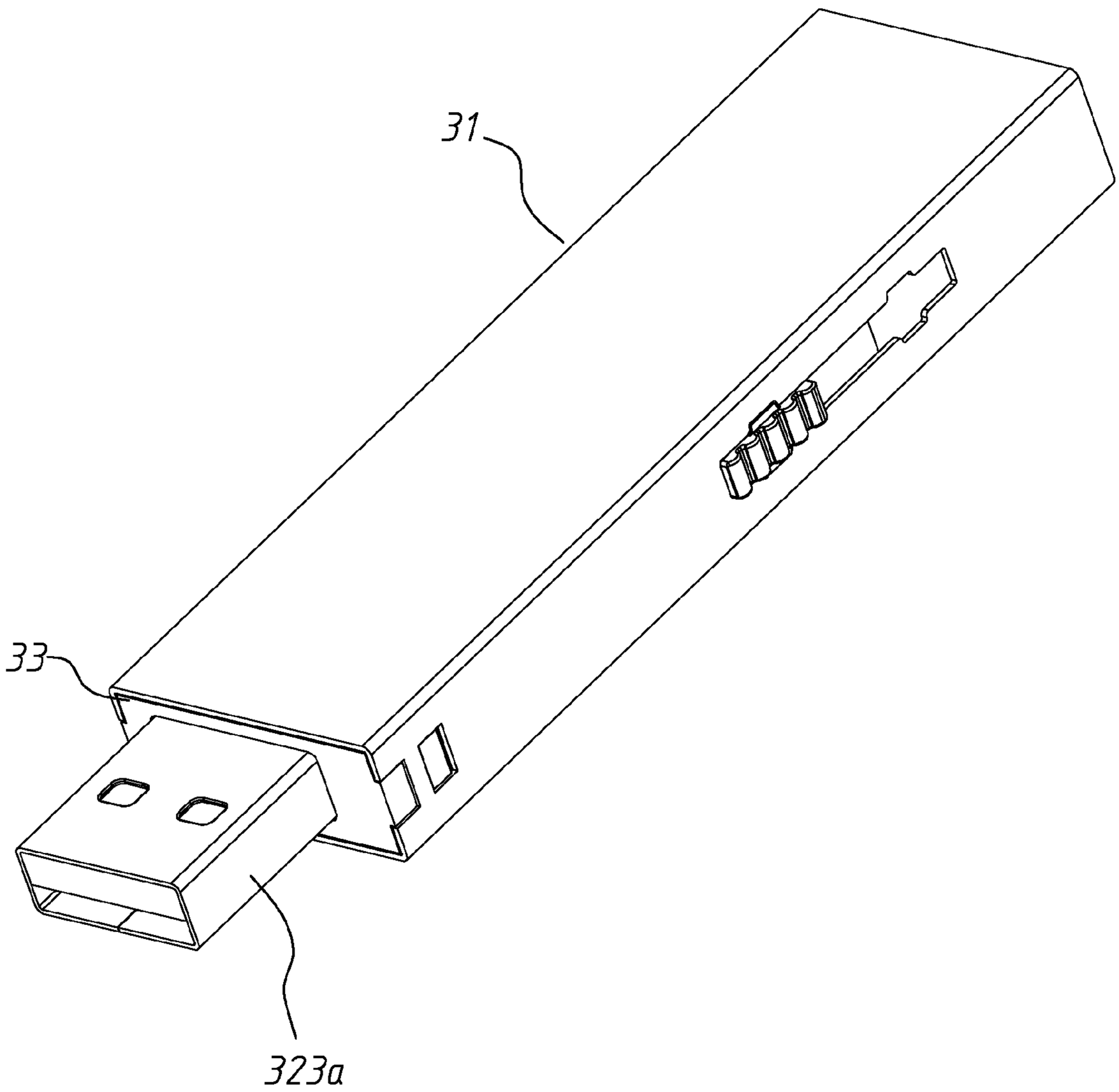

FIG. 19

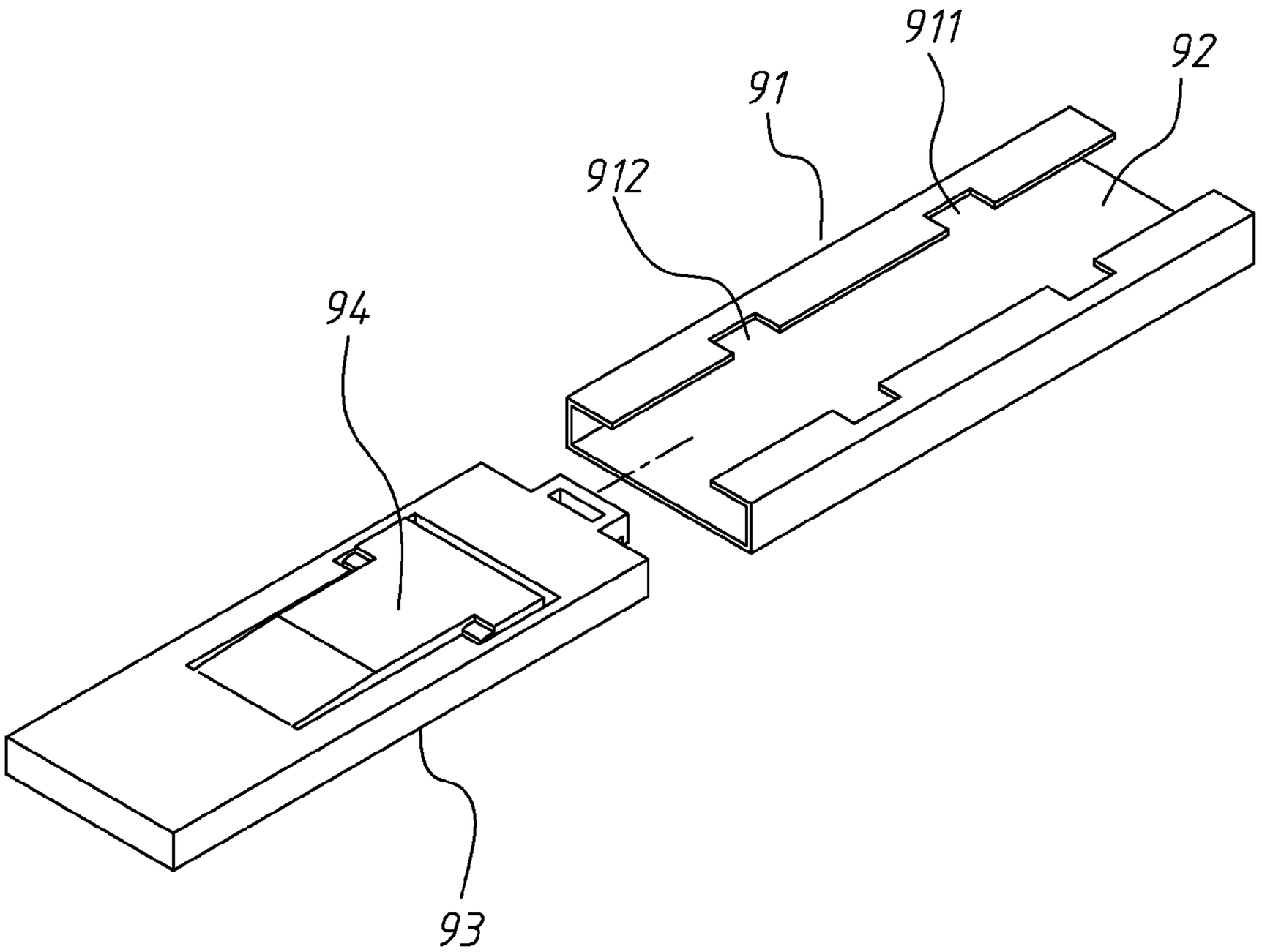

FIG. 20
PRIOR ART

RETRACTABLE USB MEMORY STICK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is a retractable USB memory stick and more particularly, to such a retractable USB memory stick that utilizes a seamless flat tube for the metal casing.

2. Description of the Related Art

USB memory stick is a mobile data storage device connectable to a computer for data access and convenient for carrying. Following fast development of technology, the storage capacity and application range of USB memory stick have been greatly improved.

Retractable USB memory sticks are commercially available. A regular retractable USB memory stick comprises a PC board having a USB interface circuit and a memory IC package, an insulative PC board holder holding the PC board, and a housing formed of two insulative half shells for accommodating the insulative PC board holder. The insulative PC board holder has a push member extended out of the housing and operable to move the USB interface circuit in and out of the housing.

U.S. Pat. No. 6,932,629 discloses a retractable USB memory stick design entitled "Device with USB terminal" in which device main body with a USB terminal and a cap including a housing space for housing at least the USB terminal are provided. The device main body and the cap are assembled so that they can be moved in an extending or compressing manner relative to each other by inserting at least the USB terminal to the housing space, or can be rotated relative to each other in an extended state without removing the cap from the device main body.

U.S. Pat. Nos. 6,979,210 and 7,462,044 disclose a retractable USB memory stick design, entitled "Thumb drive with retractable USB connector". According to this design, the thumb drive has a memory, a male USB connector coupled to the memory for connecting to a USB port of a computer appliance, and an extension/retraction mechanism coupled to the connector and memory for extending the connector from an enclosure of the drive and for retracting the connector when not in use.

Further, US application publication Number US 2008/0233776 A1, entitled "Retractable memory drive" discloses a retractable memory device having a top shell member, an intermediate carrier means, an electronic device, for example, USB thumb drive and a bottom shell member, i.e., the top shell member and bottom shell member constitute a housing.

FIG. **20** shows a simple design of retractable USB memory drive according to the prior art. According to this design, the retractable USB memory drive comprises an outer shell **91** defining a sliding way **92**, a circuit board **93** slidably received in the sliding way **92** of the outer shell **91**. The circuit board **93** has a T-shaped sliding block **94** selectively engageable into a first locating hole **911** or second locating hole **912** in the sliding way **92** to lock the circuit board **93** to the outer shell **91** in the extended or received position. This retractable USB memory drive structure is easy to assemble when compared to the prior art design in which the outer shell is formed of a top shell member and a bottom shell member, however this retractable USB memory drive structure has no means to stop the circuit board **93** in the outer shell **91**. Thus, the circuit board **93** may fall out of the outer shell **91** accidentally.

Further, the aforesaid various prior art designs have a common drawback of inconvenient and time-consuming assembly process, resulting in an increased manufacturing cost. Therefore, improvements are required.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is therefore the main object of the present invention to provide a retractable USB memory stick, which uses a metal casing prepared from a seamless flat tube, saving the manufacturing cost, simplifying the assembly process and enhancing device durability.

To achieve this and other objects of the present invention, a retractable USB memory stick comprises a metal casing, a PC board and an insulation PC board holder. The metal casing is a seamless flat tube extruded from a metal material, having opposing front opening and rear opening, a sliding slot located on one peripheral wall thereof, and at least one first locating hole and one second locating hole located on the sliding slot at different locations. The PC board comprises a USB interface circuit and a memory IC package disposed at the front side of the memory IC package. The insulation PC board holder slidably is mounted in the metal casing, comprising a base portion, a front extension configured subject to a standard USB plug, a recess defined in the base portion and the front extension at the bottom side for securing the PC board, a spring strip bridged on the base portion, a sliding block located on the spring strip and forced by the spring power of the spring strip into the sliding slot of the metal casing, and a retaining block protruded from the sliding block for selectively engaging the first locating hole or second locating hole of the metal casing. When the retaining block is engaged into the first locating hole of the metal casing, the insulation PC board holder is received inside the metal casing. On the contrary, when the retaining block is engaged into the second locating hole of the metal casing, the front extension of the insulation PC board holder and the USB interface circuit of the PC board are extended out of the front opening of the metal casing for insertion into a USB jack of an electronic device, for example, computer, for data access.

Further, the metal casing comprises a through hole located on one sidewall near the rear opening, and the insulation PC board holder has a deficit angle corresponding to the through hole of the metal casing. Thus, a chain or any small decorative or personal item can be fastened to the metal casing by means of the through hole.

Further, the metal casing can be made having a third locating hole located on the sliding slot; the insulation PC board holder can be made having a shackle that has its one end connected to the base portion of the insulation PC board holder and its other end spaced from the base portion by a gap. When the retaining block is engaged into the third locating hole of the metal casing, the insulation PC board holder is received inside the metal casing, and the gap defined between the shackle and the base portion is kept outside the metal casing.

In an alternate form of the present invention, the retractable USB memory stick comprises a metal casing, a PC board, an insulation PC board holder front member and an insulation PC board holder rear member. The metal casing is a seamless flat tube extruded from a metal material, having opposing front opening and rear opening, a sliding slot located on one peripheral wall thereof, and at least one first locating hole and one second locating hole located on the sliding slot at different locations. The PC board comprises a USB interface circuit, a memory IC package disposed at the front side of said memory IC package and a metal shield surrounding the USB interface circuit. The insulation PC board holder front member is fixedly mounted in the front opening of the metal casing, having an opening for the passing of the USB interface circuit and the metal shield. The insulation PC board

holder rear member is slidably mounted in the metal casing, comprising a recess defined in the bottom side thereof for securing the memory IC package of the PC board, a spring strip bridged on one lateral side thereof, a sliding block located on the spring strip and forced by the spring power of the spring strip into the sliding slot of the metal casing, and a retaining block protruded from the sliding block for selectively engaging the first locating hole or second locating hole of the metal casing.

When the retaining block is engaged into the first locating hole of the metal casing, the insulation PC board holder is received inside the metal casing. On the contrary, when the retaining block is engaged into the second locating hole of the metal casing, the metal shield of the PC board and the USB interface circuit of the PC board are extended out of the front opening of the metal casing for insertion into a USB jack of an electronic device, for example, computer, for data access.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded view of a retractable USB memory stick in accordance with a first embodiment of the present invention.

FIG. **2** corresponds to FIG. **1** when viewed from another angle.

FIG. **3** is an elevational assembly view of the retractable USB memory stick in accordance with the first embodiment of the present invention.

FIG. **4** corresponds to FIG. **3**, showing the USB interface circuit and the front extension extended out of the metal casing.

FIG. **5** is a bottom view of the retractable USB memory stick in accordance with the first embodiment of the present invention.

FIG. **6** is a schematic sectional view taken along line A-A of FIG. **5**, showing the operation of the retractable USB memory stick.

FIG. **7** is an exploded view of a retractable USB memory stick in accordance with a second embodiment of the present invention.

FIG. **8** is another exploded view of the retractable USB memory stick in accordance with the second embodiment of the present invention when viewed from another angle.

FIG. **9** is an elevational assembly view of the retractable USB memory stick in accordance with the second embodiment of the present invention.

FIG. **10** is an elevational view of the retractable USB memory stick in accordance with the second embodiment of the present invention, showing the USB interface circuit and the front extension extended out of the metal casing.

FIG. **11** is an elevational view of the retractable USB memory stick in accordance with the second embodiment of the present invention, showing the shackle extended out of the metal casing.

FIG. **12** is an exploded view of a retractable USB memory stick in accordance with a third embodiment of the present invention.

FIG. **13** is an elevational view of the retractable USB memory stick in accordance with the third embodiment of the present invention, showing the insulation PC board holder rear member and the PC board received inside the metal casing.

FIG. **14** corresponds to FIG. **13**, showing the USB interface circuit of the PC board and the metal shield extended out of the front opening of the metal casing.

FIG. **15** is a sectional side view of the retractable USB memory stick in accordance with the third embodiment of the present invention.

FIG. **16** is an exploded view of a retractable USB memory stick in accordance with a fourth embodiment of the present invention.

FIG. **17** is an elevational assembly view of the retractable USB memory stick in accordance with the fourth embodiment of the present invention.

FIG. **18** is an exploded view of a retractable USB memory stick in accordance with a fifth embodiment of the present invention.

FIG. **19** is an elevational view of the retractable USB memory stick in accordance with the fifth embodiment of the present invention.

FIG. **20** is an exploded view of a retractable USB memory stick according to the prior art.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. **1~3**, a retractable USB memory stick in accordance with a first embodiment of the present invention is shown comprising a metal casing **11**, a PC board **12** and an insulation PC board holder **13**.

The metal casing **11** is a seamless flat tube extruded from a metal material, having opposing front opening **111** and rear opening **112**, a sliding slot **113** cut through the top wall thereof and extending in axial direction, a first locating hole **114** located on the sliding slot **113** near its one end and a second locating hole **115** located on the sliding slot **113** near its other end.

The PC board **12** comprises a USB interface circuit **121** and a memory IC package **122**. As shown in FIG. **2**, the USB interface circuit **121** is disposed in front of the memory IC package **112**.

The insulation PC board holder **13** is slidably mounted in the metal casing **11**, comprising a base portion **131**, a front extension **132** configured subject to a standard USB plug, a recess **133** defined in the base portion **131** and the front extension **132** at the bottom side (see FIG. **2**) for securing the PC board **12**, a spring strip **135** bridged on the top side of the base portion **131**, a sliding block **134** located on the spring strip **135** and forced by the spring power of the spring strip **135** into the sliding slot **113** of the metal casing **11** after insertion of the insulation PC board holder **13** in the metal casing **11**, and a retaining block **136** protruded from the sliding block **134** for selectively engaging the first locating hole **114** or second locating hole **115** of the metal casing **11** to lock the insulation PC board holder **13** in one of an extended position and a received position.

Referring to FIGS. **3~6**, when the retaining block **136** is engaged into the first locating hole **114** of the metal casing **11** (see FIGS. **3** and **6**), the insulation PC board holder **13** is received inside the metal casing **11**; when the retaining block **136** is engaged into the second locating hole **115** of the metal casing **11** (see FIG. **4** and the imaginary line in FIG. **6**), the front extension **132** of the insulation PC board holder **13** and the USB interface circuit **121** of the PC board **12** are extended out of the front opening **111** of the metal casing **11** for insertion into a USB jack of an electronic device, for example, computer, for data access.

In actual use, the user can press the sliding block **134** to disengage the retaining block **136** from the first locating hole **114** or second locating hole **115** of the metal casing **11** for free

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

sliding movement of the insulation PC board holder **13** in the metal casing **11** between the extended position and the received position.

As stated above, the metal casing **11** is a seamless flat tube extruded from a metal material, the metal casing **11** has low cost and high durability characteristics. Further, the single piece design of the metal casing **11** facilitates quick installation of the retractable USB memory stick.

According to the aforesaid first embodiment, the a spring strip **135** is an elongated member formed integrally with the base portion **131** of the insulation PC board holder **13** and bridged over a part of the top wall of the base portion **131** so that the spring strip **135**. Further, the surface of the sliding block **134** that protrudes over the sliding slot **113** of the metal casing **11** is formed of three continuously connected arch faces to enhance finger friction, facilitating user's operation. Further, the metal casing **11** has a through hole **116** located on one lateral side thereof near the rear opening **112**; the insulation PC board holder **13** has a deficit angle **137** corresponding to the through hole **116** of the metal casing **11**. Thus, a chain or any small decorative or personal item can be fastened to the metal casing **11** by means of the through hole **116**.

FIGS. **7~9** show a retractable USB memory stick in accordance with a second embodiment of the present invention. Substantially similar to the aforesaid first embodiment, the retractable USB memory stick of this second embodiment also comprises a metal casing **11**, a PC board **12** and an insulation PC board holder **13**. The exception of this second embodiment is that the metal casing **11** further comprises a third locating hole **117**; the insulation PC board holder **13** comprises a shackle **138** that has one end connected to the rear side of the base portion **131** of the insulation PC board holder **13** and the other end spaced from the rear side of the base portion **131** by a gap **139**.

When the retaining block **136** is engaged into the first locating hole **114** of the metal casing **11** (see FIG. **9**), the insulation PC board holder **13** is received inside the metal casing **11**, the gap **139** is also kept inside the metal casing **11**, and the part of the shackle **138** outside the rear opening **112** of the metal casing **11** forms with the metal casing **11** a closed loop.

When the retaining block **136** is engaged into the second locating hole **115** of the metal casing **11** (see FIG. **10**), the front extension **132** of the insulation PC board holder **13** and the USB interface circuit **121** of the PC board **12** are extended out of the front opening **111** of the metal casing **11** for insertion into a USB jack of an electronic device, for example, computer, for data access.

When the retaining block **136** is engaged into the third locating hole **117** of the metal casing **11** (see FIG. **10**), the insulation PC board holder **13** is received inside the metal casing **11**, the gap **139** is kept outside the metal casing **11** for enabling the shackle **138** to be hooked on an object, or for allowing fastening of a chain or any small decorative or personal item to the shackle **138**. After the shackle **138** is hooked on an object, or a chain or any small decorative or personal item is fastened to the shackle **138**, the shackle **138** can be moved with the insulation PC board holder **13** back to the position shown in FIG. **9**.

FIGS. **12~15** show a retractable USB memory stick in accordance with a third embodiment of the present invention. Substantially similar to the aforesaid first and second embodiments, the retractable USB memory stick of this third embodiment also comprises a metal casing **31**, a PC board **32**, and an insulation PC board holder consisting of an insulation PC board holder front member **33** and an insulation PC board holder rear member **34**.

The metal casing **31** is a seamless flat tube extruded from a metal material, having opposing front opening **311** and rear opening **312**, a sliding slot **313** located on one lateral side thereof and extending in axial direction, a first locating hole **314** located on the sliding slot **313** near its one end and a second locating hole **315** located on the sliding slot **313** near its other end.

The PC board **32** comprises a USB interface circuit **321**, a memory IC package **322** and a metal shield **323**. The USB interface circuit **321** is disposed in front of the memory IC package **322**. The metal shield **323** surrounds the USB interface circuit **321**.

The insulation PC board holder front member **33** is fixedly mounted in the front opening **311** of the metal casing **31**, having an opening **331** for the passing of the USB interface circuit **321** and the metal shield **323**.

The insulation PC board holder rear member **34** is slidably mounted in the metal casing **31**, comprising a recess **341** defined in the bottom side thereof for securing the memory IC package **322** of the PC board **32**, a spring strip **343** bridged on one lateral side thereof, a sliding block **342** located on the spring strip **343** and forced by the spring power of the spring strip **342** into the sliding slot **313** of the metal casing **31** after insertion of the insulation PC board holder rear member **34** in the metal casing **31**, and a retaining block **344** protruded from the sliding block **342** for selectively engaging the first locating hole **314** or second locating hole **315** of the metal casing **31** to lock the insulation PC board holder rear member **34** in one of an extended position and a received position.

Referring to FIG. **13**, when the retaining block **342** is engaged into the first locating hole **314** of the metal casing **31**, the insulation PC board holder rear member **34** and the PC board **32** are received inside the metal casing **31**. Referring to FIG. **15**, when the sliding block **342** is pressed down to disengage the retaining block **344** from the first locating hole **314**, the insulation PC board holder rear member **34** is unlocked and can be moved relative to the metal casing **31**. Referring to FIG. **14**, when the retaining block **344** is engaged into the second locating hole **315** of the metal casing **31**, the USB interface circuit **321** of the PC board **32** and the metal shield **323** are extended out of the front opening **311** of the metal casing **31** for insertion into a USB jack of an electronic device, for example, computer, for data access.

Further, as shown in FIG. **15**, the memory IC package **322** comprises two retaining notches **324** bilaterally located on the rear side thereof; the insulation PC board holder rear member **34** comprises two retaining rods **345** suspending in the rear side inside the recess **341** and respectively engaged into the retaining notches **324** to lock the PC board **32**.

Further, the insulation PC board holder front member **33** comprises two retaining blocks **332** respectively located on the two opposite lateral sides thereof; the metal casing **31** comprises two retaining holes **316** respectively located on the two opposite lateral sides thereof near the front opening **311** for securing the two retaining blocks **332** of the insulation PC board holder front member **33**. Further, the insulation PC board holder front member **33** comprises two locating blocks **333** respectively disposed in front of the retaining blocks **332** and respectively engaged into a respective locating notch **317** on the front side of the metal casing **31**.

FIGS. **16** and **17** show a retractable USB memory stick in accordance with a fourth embodiment of the present invention. This fourth embodiment is substantially similar to the aforesaid second embodiment with the exception that, the retractable USB memory stick uses a metal PC board holder **14** to substitute for the aforesaid insulation PC board holder **13**, i.e., the retractable USB memory stick of this fourth

embodiment comprises a metal casing **11**, a PC board **12** and a metal PC board holder **14**. The spring strip **145** of this fourth embodiment is a detachable design, i.e., the spring strip **145** has opposing front and rear end portions **1451** respectively engaged into a respective mounting hole **14***a* on the top side of the metal PC board holder **14**. Further, the sliding block **144** is formed on the top side of the spring strip **145**. The PC board **12** is bonded to the inside of the metal PC board holder **14** with an adhesive, and movable with the metal PC board holder **14** along the sliding slot **113** of the metal casing **11** between the extended position and the received position.

FIGS. **18** and **19** show a retractable USB memory stick in accordance with a fifth embodiment of the present invention. This fifth embodiment is substantially similar to the aforesaid third embodiment, comprising a metal casing **31**, a PC board **32**, and an insulation PC board holder consisting of an insulation PC board holder front member **33** and an insulation PC board holder rear member **34**. However, the PC board **32** of this fifth embodiment is not a single memory IC design. According to this fifth embodiment, the PC board **32** comprises a multi-chip memory package **325**, and a USB plug **323***a* forwardly extended from the multi-chip memory package **325**. Other component parts and operation of the retractable USB memory stick in accordance with this fifth embodiment of the present invention are substantially same as the aforesaid third embodiment

Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

What the invention claimed is:

1. A retractable USB memory stick, comprising:

a metal casing that is a seamless flat tube extruded from a metal material, having opposing front opening and rear opening, a sliding slot located on one peripheral wall thereof, and at least one first locating hole and one second locating hole located on said sliding slot at different locations;

a PC board, said PC board comprising a USB interface circuit and a memory IC package disposed at a front side of said PC board; and

an insulation PC board holder slidably mounted in said metal casing, said insulation PC board holder comprising a base portion, a front extension configured subject to a standard USB plug, a recess defined in said base portion and said front extension at a bottom side for securing said PC board, a spring strip bridged on said base portion, a sliding block located on said spring strip and forced by the spring power of said spring strip into said sliding slot of said metal casing, and a retaining block protruded from said sliding block for selectively engaging said first locating hole or said second locating hole of said metal casing to lock said insulation PC board holder to said metal casing in one of an extended position and a received position;

wherein said sliding slot is located on the top wall of said metal casing;

wherein said metal casing further comprises a third locating hole located on said sliding slot; said insulation PC board holder comprises a shackle that has a first end connected to said base portion of said insulation PC board holder and a second end spaced from said base portion by a gap; when said retaining block is engaged into said third locating hole of said metal casing, said insulation PC board holder is received inside said metal casing, and the gap defined between the second end of said shackle and said base portion is kept outside said metal casing.

2. The retractable USB memory stick as claimed in claim **1**, wherein said spring strip is bridged on said base portion of said insulation PC board holder.

3. The retractable USB memory stick as claimed in claim **1**, wherein the surface of said sliding block that protrudes over said sliding slot of said metal casing is formed of three continuously connected arch faces.

4. The retractable USB memory stick as claimed in claim **1**, wherein said metal casing comprises a through hole; said insulation PC board holder comprises a deficit angle corresponding to the through hole of said metal casing.

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